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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/706,274	11/03/2000	Susanne Arney	ARNEY 8-51-1	6293

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EXAMINER
SODERQUIST, ARLEN

ART UNIT	PAPER NUMBER
1743	5

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Please find below and/or attached an Office communication concerning this application or proceeding.

AS-5

Office Action Summary

Application No.	Applicant(s)
09/706,274	Arney et al.
Examiner	**Art Unit**
Arlen Soderquist	1743

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☐ Responsive to communication(s) filed on _____.

2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 1-43 is/are pending in the application.

4a) Of the above, claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 1-43 is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____
4) ☐ Interview Summary (PTO-413) Paper No(s). _____
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

1. Claims 1-43 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In claims 1, 16 and 29 the sensor trace is "configured to oxidize at a rate greater than an electrical component associated with the sensor trace" yet the electrical component is not positively recited as an element of the device or fails to have any positively recited structure in the claims. Therefore it is not clear what structural configuration allows this to occur: an electrical biasing structure or some other structure. For claims 1, 16 and the claims which depend therefrom, the electrical component is being treated as nonlimiting. For claim 29, the claim is being treated as met by means to place a bias between two metal electrodes (see claim 30).

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claims 1-4, 6-11, 13-17, 19-24 and 26-28 are rejected under 35 U.S.C. 102(a) as being clearly anticipated by Shea (the authors differ from the instant inventors). In the paper Shea discusses anodic oxidation and reliability of MEMS polysilicon electrodes at high relative humidity and high voltages. The authors present a full factorial study of the effect of relative humidity and voltage on the oxidation of surface-micromachined poly-silicon wiring and electrodes. The system consists of 500 nm thick poly-Si wires and electrodes insulated from the substrate wafer by 600 nm of Si-rich SixNy, fabricated using a surface-micromachining process. In dry ambients, oxidation or damage to the bottom poly-Si layer in MicroElectroMechanical

Systems (MEMS) devices occurs so slowly that little can be learned in a timely manner, even when stressing the electrodes at electrical fields close to dielectric breakdown. They observed however that in ambient with elevated relative humidity the wires and electrodes anodically oxidize within a short period of time when operated at moderately large voltages. Only the most positively biased poly-Si structures oxidize, and they describe the anodic oxidation and association volume expansion as a function of a number of accelerating factors including relative humidity and voltage. A threshold was observed in relative humidity but not in voltage. The figures show the various configurations.

4. Claims 1-5, 7-11, 14-18, 20-24 and 27-28 are rejected under 35 U.S.C. 102(b) as being anticipated by each of Burack, Mancke and Wada (1989).

In the paper Burack discusses enhanced moisture protection of electronic devices by ultrathin polyimide films. Thin films of polyimide which exhibit enhanced resistance to moisture were fabricated using the Langmuir-Blodgett (LB) technique. The adhesion strength of both LB and spin-coated films of several different polyimides, deposited on fused silica, was measured by subjecting these films to steam or water, followed by a tape test, and monitoring changes in the UV spectra of the films, showing that the LB films of polyimide adhere better to fused silica than spin-coated films. In addition, water vapor transmission rate measurements through Kapton sheet coated by a monolayer of any of the polyimides show that a monolayer forms a moisture barrier, decreasing the water vapor transmission through the Kapton. Based on these results, the electrical performance of polyimide films was tested at 85°, 85% humidity, by measuring leakage current between conducting paths (figure 6) under 180-V bias, on samples which were coated with various combinations of LB and spin-coated polyimide films. Composite films of polyimide consisting of a LB monolayer, either underneath or on top of a thick, spin-coated film, exhibited superior electrical performance to either a spin-coated or LB film by itself. This may be explained by the improved adhesion and/or decreased water permeability of polyimide LB films.

In the paper Mancke discusses a moisture protection screening test for hybrid circuit encapsulants. An empirical comparative screening test for polymeric encapsulants was described with respect to figures 1-4 and used to indicate how well different materials prevent unwanted

leakage currents between closely spaced biased metal lines in hybrid integrated circuits. The screening test circuit, test procedure, and test conditions are described. This test and measurement equipment were developed earlier by N. L. Sbar and R. P. Kozakiewicz (1977-9). Data for two silicone coatings and one epoxy coating were compared with data for DC 3-6550 RTV. Results are also shown for layers of two different polymer coatings. The coatings of the same general polymer type varied considerably in performance in this screening test.

The Wada paper discusses the influence of passivation layer on aluminum corrosion on simulated microelectronics circuit pattern. The corrosion of thin Al is one of the important failure mechanisms in integrated circuits. Al corrosion and electrolytic leakage current were studied by temperature-humidity-bias tests. Two different passivation layers were investigated: a double layer of nondoped silicate glass (NSG) on phosphosilicate glass (PSG), and single layer of plasma-deposited SiN. Samples were prepared with 3 different combinations of width/spacing: 2/2 μm (width/spacing), 4/4 and 12/6 μm, 2/2 and 4/4 μm patterns with a passivation layer on the stripes and a 12/6 μm pattern in which a part of the passivation layer is etched to expose the Al stripe. Investigation of these patterns via temperature-humidity-bias tests leads to the following conclusions. With SiN passivation, cathodic Al corrosion did not occur on 2/2 and 4/4 μm patterns. On the other hand, with PSG + NSG passivation, cathodic corrosion occurred on 3 patterns. In 12/6 μm patterns with SiN passivation, the leakage current increased earlier than did that of 2/2 and 4/4 μm SiN passivated patterns. Thus, leakage current is conducted through the interface between the passivation layer and the plastic resin. In a special Al pattern in which a part of SiN passivation layer is etched to expose the stripe, local anodic corrosion was dominant. This anodic corrosion can be explained by the F in CF4/O2 plasma used for SiN etching.

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 29-40 and 41-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shea, Burack, Mancke or Wada as applied to claims 1-11, 13-24 and 26-28 above, and further in view of Lowry. The Shea, Burack, Mancke or Wada papers do not teach an integrated circuit including the sensing device.

In the paper Lowry teaches a surface conductivity moisture monitor for hermetic IC packages. An in-situ surface conductivity sensor for measuring water content of hermetic integrated-circuit (IC) package cavity ambients is described. The sensor is a 50 × 95-mil chip whose surface consists of an interdigitated pattern of Al stripes on SiO_2. The chip is mounted and wire bonded as a test vehicle into the package configuration whose moisture content is to be determined. The hermetically sealed specimen package is cooled in a temperature bath with 50 V d.c. applied to the sensor. As moisture condenses onto the sensor surface, the leakage current of the metal pattern rises. The temperature value of the leakage current peak represents complete condensation of all available water vapor, and this is converted to ppm water content. Sensor performance is evaluated via correlation experiments with mass spectroscopy and volume-effect sensors. Use of the sensor to estimate levels of metal ions within the package cavity is also described.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the sensors of Shea, Burack, Mancke or Wada into an integrated circuit package as taught by Lowry because of their ability to detect moisture.

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The additional art related to detecting failures in electrical devices.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arlen Soderquist whose telephone number is (703) 308-3989. The examiner's schedule is variable between the hours of about 5:30 AM to about 5:00 PM on Monday through Thursday and alternate Fridays.

For communication by fax to the organization where this application or proceeding is assigned, (703) 305-7719 may be used for official, unofficial or draft papers. When using this number a call to alert the examiner would be appreciated. Numbers for faxing official papers are 703-872-9310 (before finals), 703-872-9311 (after-final), 703-305-7718, 703-305-5408 and 703-305-5433. The above fax numbers will generally allow the papers to be forwarded to the examiner in a timely manner.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Arlen Soderquist

August 14, 2002

ARLEN SODERQUIST
PRIMARY EXAMINER